

MELTDOWN at the TOP of the WORLD

The Toronto Star

November 19, 2022 Saturday

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Section: INSIGHT; Pg. IN2

Length: 3934 words

Body

It was on Dec. 19, 2015, that 5,000 tonnes of snow barrelled down Sukkertoppen, the mountain that overlooks Longyearbyen, the world's northernmost town that's inhabited year round.

A 200-metre-wide slab of snow wiped out the wooden beams that secure Longyearbyen's homes in the permafrost, sending houses in the town in Norway's Svalbard archipelago sliding like sleds.

Longyearbyen, which is halfway between mainland Norway and the North Pole, has about 2,500 residents. On that December morning, under the darkness of the polar night, which encapsulates the Arctic village for three months of the year, 25 people inside 11 homes were swept away. About nine people, including three children, were buried, some for more than two hours.

Walking around on the compressed snow in the moments after, Strøm remembers the eerie quiet, the feeling of helplessness in her stomach, and a strange, indescribable smell - something she had never experienced before, and struggles to describe now. "It was unbelievable for me to take in," she says. Random objects were scattered about: a bicycle here, a pillow there.

Then, Strøm noticed the desperate father. He was furiously digging for his daughters, just two and three years old, their tiny bodies missing in the cloud of white. The town jumped into action. "All the people in Longyearbyen were digging trying to find those two girls," Strøm says.

After two hours, a rescue worker found the younger girl and, 10 minutes later, her sister. Both were rushed to the hospital in Tromsø, a city about an hour and a half's flight away on mainland Norway. The elder sister survived. But the little one didn't make it. Also lost that day was 42-year-old Atle Husby, the town's music teacher and a father of three. He was found three hours after the avalanche first hit, suffocated by the snow in his bedroom, according to a local journalist.

More than six years later, Strøm still isn't ready to share all the things she saw and experienced that day. When she does speak about it publicly, she says, "It's impossible not to cry." Flanked by her husky, Ettra, Strøm gestures toward the ground where the houses once stood - a lost row of the town's iconic spisshus timber homes, colourful A-frames that sit at the base of Sukkertoppen. Strøm herself lives in one just around the corner. Steel avalanche barriers that now line the mountain above are like scars from that day.

It's difficult to pin a single weather event on climate change, but the avalanche was a symptom of broader changes that are happening in Svalbard.

The weather in this part of the world is getting warmer and wetter, throwing off an entire ecosystem and making such disasters more common. The fiord that surrounds Longyearbyen doesn't freeze over like it did a generation ago. The glaciers that cover more than half of the archipelago are receding rapidly. Reindeer are starving to death because changing weather patterns are preventing them from reaching the plants they feed on.

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Stories like these, about what we lose as the climate changes, are everywhere. Heat waves. Floods. Fires. Mudslides. Avalanches. But nowhere is the climate crisis accelerating more quickly than in this Arctic town, where existential changes are threatening to upend one of the world's most important ecosystems.

Svalbard is warming faster than anywhere else on earth. The people who live there are watching it happen.

It's long been known that the Arctic is warming about three times as fast as the rest of the world. Greenhouse gas emissions from human activity are causing more and more solar energy to become trapped in the atmosphere, artificially heating the earth. Rapidly rising global temperatures are melting Arctic sea ice, exposing dark oceans beneath. Ice reflects sunlight, but water absorbs it. As ice melts, oceans absorb more and more heat, warming the earth's air, and melting more ice, in a vicious circle.

But Svalbard is warming even faster than the rest of the Arctic. Research released in June confirmed by just how much. Norwegian and Russian scientists analyzed air temperatures dating back to the 1980s, and found the northern Barents area, which surrounds Svalbard, is warming by an average of 1.7 to 2.1 C per decade. That's two to two-and-a-half times as fast as the Arctic warming average and five to seven times as fast as the rest of the world.

"This is really extraordinary," says lead author Ketil Isaksen, of the Norwegian Meteorological Institute. The warming was above and beyond even what climate models had predicted, he said, and signals what may soon be in store for other parts of the Arctic. The scientists also found that relationship between melting sea ice and warming air is even stronger around Svalbard than they had previously thought.

Part of the reason why Svalbard is warming faster than the rest of the Arctic is because it receives the tail end of the Gulf Stream, a powerful, warm ocean current from the Gulf of Mexico.

Increased heat transport by this warm current, combined with rising air temperatures, is causing an unprecedented decline in winter sea ice. When sea ice melts in the winter, the warming effect is more powerful, says Isaksen, since "the disappearing sea ice, which normally acts as a blanket, no longer traps the existing heat in the ocean." Instead, "the open water is warming up the cold polar air."

Stepping off the plane at the world's northernmost commercial airport is like stepping onto another planet. The chill of the high Arctic wilderness kisses your cheeks. Sweeping misty grey mountains spotted with summer snow give way to a valley that hosts the colourful, eclectic town of Longyearbyen.

Here, reindeer roam the streets like pedestrians, and snowmobiles outnumber cars. The town's main street is quiet on a Monday afternoon in June, but the local cafe, which sells freshly made sandwiches and pastries, is a hub of activity, with residents and tourists chatting with friends over cappuccinos. A smattering of bars, restaurants - serving everything from haute cuisine to Thai food to sushi - shops, a library and an Arctic university make Longyearbyen a vibrant home for its residents, who hail from roughly 50 countries.

Life on Svalbard has always been extreme. The sun sets each year in early October and doesn't rise again until March. More than 3,500 polar bears are estimated to live on the archipelago, outnumbering the human population by about 1,000, according to the Norwegian Polar Institute. Residents of Longyearbyen are legally required to carry a rifle when leaving the town boundary for protection. With just 46 kilometres of paved road across the archipelago, which is slightly smaller than Ireland in size, people travel by snowmobile in the colder months, when frozen fiords and snowy valleys make the islands more accessible.

After its discovery by a Dutch explorer in 1596, Svalbard, which has no Indigenous population, existed as a no-man's land until a 1920 treaty formally designated it as Norway's, but gave country signatories equal rights to access and extract resources from the land. Citizens of any country can settle on Svalbard visa-free, so long as they have a job, a place to live, and retain an address elsewhere.

There is no traditional cycle of life on Svalbard. Because the local hospital isn't equipped to handle childbirth, pregnant residents are expected to return to their home countries to give birth. Death on the archipelago is also

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highly discouraged, since Svalbard's icy climate means bodies can't decompose properly. In the late 1990s, a group of researchers led by Canadian medical geographer turned Liberal MP Kirsty Duncan found some remnants of the 1918 Spanish Flu on Svalbard, in the preserved bodies of seven former coal miners who died there. At one point, it was believed that thawing permafrost would result in another outbreak of the disease - as was the case with an anthrax outbreak in northern Siberia in 2016 triggered by the thawed body of an infected reindeer - but scientists have now mostly ruled that out.

Like most who live there, it was the wild and pristine nature that drew Strøm to Svalbard more than 25 years ago. She's still enamoured by it. "I feel part of something that's bigger than myself," she says, her blond hair blowing in the chilly summer breeze, the temperature just barely above freezing. "I feel vulnerable and still strong."

Svalbard's quirky rules and harsh climate mean few who live there have roots on the archipelago. "This is a community where people stay for a few years and then they leave," says Strøm.

She and a couple of hundred other long-term residents hold this place's memories.

For the people who live in Longyearbyen, the climate crisis is just as psychological as it is physical. Their lives are, quite literally, being uprooted.

Following the 2015 avalanche, local authorities established a new warning system and mapped Longyearbyen according to avalanche risk. They found more than 150 residences and student dorms were in the "red zone," meaning there was a high chance of an avalanche hitting them in a 100-year storm. Just two months after the findings were presented, in February 2017, another avalanche hit the street next to where the houses were swept away in 2015, this time wiping out two apartment buildings. (Everybody inside survived). Despite heavy snow and wind the day before, city officials had decided not to evacuate residents. Experts had assessed the situation, and didn't think there was enough snow to hit the buildings. They were wrong.

Svalbard is technically classified as an Arctic desert, meaning its yearly rainfall should be about the same as the Sahara's. But warmer weather is causing more precipitation to fall as rain rather than snow, creating a slippery foundation on the hillsides and heightening the risk that snow, slush, mud or rocks will come tumbling down.

"The town that everybody loved and felt safe in does not represent security anymore," says Kim Holmén, a reflective, soft-spoken man with a Dumbledore-esque beard. A senior adviser at the Norwegian Polar Institute, Holmén has studied Svalbard for more than 30 years. Since then, he's watched the average winter temperature rise by 10 C - far beyond the 1.5 C global heating threshold for which world leaders have agreed to strive.

"It used to be something special to go outdoors; now it is as nonchalant as running to the bus in Stockholm or Oslo; sometimes you button your coat, sometimes you just run."

Everywhere Holmén looks, he can see changes that he has observed in his own lifetime. "It is not just some decimal change. It is kilometres of glacier ice, it is changes of species, it is avalanches, it is insecurity for human beings, it is economic hardship, it is loss of a unique ecosystem."

Beneath the village lies a thick layer of permafrost: a mix of soil, gravel and sand, bound together perennially by ice. But soaring temperatures are causing the permafrost to thaw, destabilizing Longyearbyen's houses, which are built on wooden pillars drilled into the ice, and making them rot and sag.

Even the dead are at risk. The local cemetery, which holds the coffins of coal miners who died in the early 1900s, has narrowly avoided being taken out by a landslide on several occasions.

The threat posed by Svalbard's warming permafrost drew global attention in 2017, when, after an unusually warm winter, a flood of meltwater breached the entrance to the Global Seed Vault, a storage facility that safeguards more than one million of the world's seed varieties deep within Svalbard's icy rock. Located on the outskirts of Longyearbyen, the so-called "doomsday" vault serves as an insurance policy for the world's agricultural biodiversity, storing duplicate seeds from all over the globe at a cool -18 C.

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Beyond physical flooding, scientists warn thawing permafrost could have an even more disastrous effect on the planet, in the form of greenhouse gas emissions. The world's permafrost, mainly in Siberia and Canada, has captured and stored greenhouse gases for thousands of years; about 1.3 trillion tonnes of carbon in the form of CO₂ or methane are estimated to be held in ice beneath the earth, twice the amount in the earth's atmosphere. As global heating causes more and more permafrost to melt, those emissions get released back into the air, accelerating the climate crisis.

Svalbard, with its expansive icy waters, polar bears, and rhythmic interplay between darkness and daylight, may feel distant, but what happens on the archipelago reverberates around the world. The Arctic acts as a great regulator for the earth's climate, and polar melt is disrupting this mechanism.

"What is special about the Barents Sea is that we have this very strong retreat and decline of sea ice during the autumn and winter, which really affects the weather systems," says Isaksen, bringing "more humid air and higher temperatures" toward Europe, Asia and North America. Scientists have linked Arctic warming to far-flung weather events such as heavy rainfall in China and Japan and a cold snap in Texas.

Living in ground zero of climate change, Longyearbyen's residents are more conscious than most of the vulnerability of the earth to human emissions, and the burning need for action. But locals also wrestle with the uncomfortable reality that just by living there they are accelerating the very dynamics that threaten the place that they love.

Longyearbyen's remote location and reliance on coal power mean it has one of the highest carbon footprints per capita on earth.

"Since this is such a harsh climate, people are very aware of what kind of weather it is, how the seasons are now," says Are Nundal, the town's culture minister. "Everyone knows that this May has been extremely mild, and you can see it in many ways: how fast the seasons change, how fast the snow disappears from the hillside.

"On the other hand, this is kind of a dilemma ... Everyone knows that living here doesn't contribute to a better climate."

For centuries, humans have ventured to Svalbard to extract its resources. First, whalers came in search of lucrative whale oil, and later, trappers spent winters in isolated cabins hunting rare Arctic species, like foxes, polar bears and seals. Then in the early 1900s, coal mining began on Svalbard, which brought humans there in big numbers and led to the establishment of Longyearbyen.

Norway has phased out coal mining on Svalbard over the past two decades, and now state-owned Store Norske operates just one mine, Mine 7, which supplies the local power plant. Though, not for long: the Norwegian government has promised to shut down Longyearbyen's coal-fired power plant in 2023 and temporarily switch to diesel until it can find a more sustainable option, effectively closing Mine 7 with it. (Elsewhere on Svalbard, Russia also operates a mine.)

Another reason why Svalbard's carbon footprint is so high is because people have to fly to get to and from the archipelago. "Living here requires much more energy per household than anywhere else in the world," Nundal says. Scientists at the local university found the amount of carbon a round-trip flight from Oslo to Longyearbyen emits corresponds to the loss of one square metre of summer sea ice per passenger. By one prediction, the Arctic could be ice-free in summer as soon as 2035.

These days, Svalbard's biggest industry is tourism, but Longyearbyen still feels like a mining town. A statue of a coal miner overlooks the centre of the community. Traditions linger, such as the practice of taking your shoes off in restaurants and shops, a holdover from the days when coal dust lined people's boots. For some, phasing out coal means stripping the town of a crucial part of its identity. Others question whether there is really another option for Svalbard, where extreme seasons make relying on renewable energy sources complicated. The rising cost of fuel following Russia's invasion of Ukraine has already cast doubt on the Norwegian government's timeline for the transition.

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Twenty-year-old Erik Ekeblad Eggenfellner, a fresh high school graduate, admits it "sounds counterintuitive" to fight for climate action but still want there to be coal mining on Svalbard. "I feel like it's important for us to have the coal, because of the context," he says. "But at the same time, I know that on a global scale, we need to phase out coal."

Eggenfellner's family is one of 20 or so that have lived on Svalbard for multiple generations ("Those people, they're Svalbard people," he says proudly). His grandfather and his father were coal miners. Now, Eggenfellner, too, works for "the company" (as locals call Store Norske), as part of an ambitious project cleaning and restoring what was once Svalbard's biggest mine to its original environmental conditions.

Growing up in Longyearbyen, Eggenfellner got his snowmobile licence at 16 and a rifle for his 18th birthday - a ticket to explore Svalbard's vast (and bear-filled) landscape on his own. It's the freedom that he loves most about his home. "I have my snowmobile. I have my backcountry skis. And I can just go, wherever I want," he says.

But with every degree of warming, Eggenfellner sees that freedom slipping away. When he was a kid, Eggenfellner's father would tell him stories about times he drove his snowmobile across Isfjorden, the slice of ocean northwest of Longyearbyen. "I can barely remember even seeing ice on the fiord," says Eggenfellner. "The entire future of the archipelago is very uncertain."

It's impossible to find someone in Longyearbyen who hasn't been touched by the climate crisis. When fighting a threat that, to many, feels invisible, personal connection can be a galvanizing force.

"Cause you can tell people all you want about, 'Oh, yeah, the oceans are rising' and everything," says Eggenfellner. "But I feel like when I tell people that my teacher was killed in an avalanche caused by climate change, or when I tell people that I can't do stuff my dad could because of climate change, then that's more personal and people take it more seriously."

Strøm agrees to share her painful memories from the avalanche, in the hopes that her nightmare can be someone else's call to action. "I am really a big part of the problem, living here," Strøm says. "It is absolutely necessary to me to feel that I am also part of the solution."

In 2019, Strøm and Canadian explorer Sunniva Sorby (along with canine companion Ettra) went to live in a trapper's hut 140 kilometres away from Longyearbyen, where they spent 18 months as citizen scientists collecting data on sea ice, water, animals, phytoplankton and more. They were entirely self-sufficient, and relied on solar and wind energy for power. Strøm and Sorby made history, as the only women ever to overwinter on Svalbard without a man. The pair run Hearts in the Ice, a platform where they promote climate action through education, and have spoken with more than 100,000 students from around the world about their expedition.

No matter what, Svalbard will get hotter. Even under a "medium emissions" scenario, where the world drastically cuts emissions from 2040, scientists predict Svalbard will warm a further 7 C by 2100, and as much as 10 C if emissions stay constant. (To put things into perspective, Canada's current goal is to reach net-zero emissions by 2050.) That will mean shorter snow seasons, more rain, less ice, higher sea levels, more avalanches and mudslides, and less security for residents.

Since the 2015 avalanche, dozens of Longyearbyen's most precarious homes have been demolished, and hundreds of residents have been evacuated. In 2021, parts of the town had to be evacuated three times in the months of March and April due to avalanche risk, the city said, affecting as many as 105 residents at a time.

The town has been divided into zones based on risk, and depending on the vulnerability level of the area, different activities are permitted there. "If you have people living, it has to be in the most secure areas," Nundal says. "But you can have your work, for instance, in other areas." Nybyen, a high-risk neighbourhood at the southern end of the city, has been deemed too costly to protect, Nundal says. "Sooner or later, they will abandon the houses and they will cut off the infrastructure."

But not all hope is lost: Dozens of new, climate-resilient homes have already been built, higher above the ground and rooted in the permafrost with steel poles instead of wooden pillars. The new buildings come with sensors that

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can detect changes in temperature and rainfall that could threaten safety. Steel avalanche barriers, built in 2018, help to keep snow in place on Sukkertoppen and give comfort to residents below. The town's mayor, Arild Olsen, plans to take Longyearbyen to zero emissions. The town purchased a giant battery this year, a first step toward switching to renewable energy.

Longyearbyen's transition will hold lessons for the rest of the world, because although the Arctic town is among the first to crumble under climate change, it will certainly not be the last. Crucially, as a territory of Norway, Longyearbyen benefits from enormous resources that many other vulnerable parts of the world lack.

The past decade has seen Svalbard become a burgeoning destination for tourists who want to see its polar bears, icy fiords and shimmering glaciers before it's too late. In 2019, the archipelago clocked a record of more than 150,000 overnight guest stays, and tens of thousands more people visit each year on cruise ships. Tourism has bypassed coal mining to become Svalbard's largest employer, and along with scientific research, one of the main pillars sustaining Longyearbyen's economy. But with a landscape so fragile, many wonder whether it's possible to showcase Svalbard, in all of its untouched beauty, while still preserving it.

It's a question that occupies the mind of Frédéric Gendron, a guide for Brim Explorer, a company that offers hybrid-electric boat tours across Norway. He worries the concept of "last chance tourism," where people rush to see a landscape before it's lost to climate change, is growing in the Arctic.

But it ultimately comes down to intention, he says: on the part of the tourist, to learn, and on the part of the host community, to teach. There is no questioning the power that Svalbard has as a vantage point to the climate discussion. "When it comes down to speaking about global warming, I think my message is a lot stronger and has more impact here than it would anywhere else," Gendron says.

Norway is clamping down on large cruise ships headed to Svalbard, partly because of the environmental impact, but also because the town doesn't have the safety infrastructure to care for thousands of additional people in the event of an emergency.

On whether or not it is ethical to travel to Svalbard, Holmén, the bearded polar scientist, has a short answer and a long answer. The short answer: yes. The long: "We must question everything we do all the time and look for ways of decreasing our collective footprint on the planet. We are eight billion people and we all have a responsibility for keeping it livable for all of us."

Climate change was seen to have claimed its first lives in Svalbard during the 2015 avalanche. It was a turning point for longtime residents, and "nothing is like it was before," Strøm says. The changes she witnessed in the 15 years prior frightened her, but she didn't know what to do at the time.

Then the avalanche hit, and it swept away the community's ability to delay on climate action.

"It was as if my house was burning down, and all of a sudden I woke up."

Classification

Language: ENGLISH

Publication-Type: Newspaper

Journal Code: TTA

Subject: AVALANCHES (89%); WEATHER (78%); CHILDREN, ADOLESCENTS & TEENS (77%); WRITERS (73%); CLIMATE CHANGE (61%); CLIMATOLOGY (60%)

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Industry: WRITERS (73%)

Geographic: LONGYEARBYEN, SVALBARD (94%); SVALBARD & JAN MAYEN (96%); NORWAY (93%); ARCTIC (79%)

Load-Date: November 19, 2022

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